A SOCIO-ECONOMIC SURVEY OF BAMBARA PROCESSORS IN FOUR SELECTED COMMUNITIES IN THE NORTHERN REGION OF GHANA

Submitted under the DFID/CPHP/FRI Bambara Processing and Utilization Project

BY

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ABSTRACT

Socio-economic surveys were conducted in four selected project communities in northern Ghana to investigate the socioeconomic status of the bambara processors, assess the marketing potential of processed products and, most importantly, to establish the levels of all project performance indicators prior to the dissemination of high quality bambara flour (HQBF) technologies for impact tracking purposes. Bambara processing was found to be exclusively a female activity and a full-time job for most of the women interviewed. It is a trade which is passed on from generation to generation, most daughters taking over from the mothers. Processing is on a limited scale, ranging between 1 - 10 bowls of bambara per day, and processing is done throughout the week (5 - 8 h a day). *Koose*, *Tubani* and *Gablee* are the popular foods prepared from bambara for sale. However, there is high degree of tribal diversity and variability in the preparation methods. These products are retailed directly to consumers. All food vendors process their own bambara flour to ensure good quality fresh flour. Bambara flour is not currently available on the market. Processors prefer the cream coloured, big size and well dried bambara grains due to its taste, flour yield and end-product quality. A quick assessment of the processing/food preparation activities of the women revealed daily gross margins of ¢3,000 to ¢100,000. This translates into monthly income of ¢84,000 to ¢280,000. Gross margins are highly variable, and the factors affecting gross margin on the bambara processing activity include geographical location, cost of grain and other materials, quality of grain, level of patronage, scale of processing, and management practices adopted by the processors. With the exception of processing levels, incomes and bambara recipes, all other performance indicators are starting from the zero-base. The following recommendations were made from the findings of the study. That there is the need to consider all the different methods of food preparation and come up with more standardized and widely accepted recipes. The project should also focus more on processors with entrepreneurial capacities, especially those who process more than 5 bowls a day and are more interested in adding profitable product lines to existing businesses or introducing variety of dishes to their main lines of operations. Cream colored and big size grains should be used for HQBF production. HQBF for the supermarket should be packaged in a well labeled and attractive packaging material with adequate nutritional and utilization information. Work on shelf life studies of bambara-based products should be encouraged.

INTRODUCTION

Bambara groundnut (*Vigna subterranea* (L) Verde.) is a traditional crop grown on subsistence farms purposely for domestic consumption and to a limited extent for sale. It has high nutritive value and food processing potential - is a well balanced food in terms of protein, carbohydrate and lipid content with low levels of anti-nutritional factors. Generally, the crop is grown in the northern parts of the country and some parts of the Volta region on small scale. It is popularly eaten fresh (boiled) during harvest time or processed into flour when dried for the preparation of a wide range of traditional dishes. Despite its importance as a food security crop especially, among the farming communities, bambara groundnut is gradually becoming a forgotten crop due to its long cooking time and its attendants gas or 'stomach problems' when eaten. The bambara industry received very little research attention in the past, however, enough evidence has been provided through projects funded by the European Community (FP3EU) that bambara groundnut is a crop with considerable potential deserving further investigation.

In 1999, a preliminary project, funded by the Crop Post Harvest Programme (CPHP) of the UK Department for International Development (DFID), investigated into the factors that affect the processing and increased utilization of bambara groundnut in two sub-Saharan countries, Zimbabwe and Swaziland. Also through CPHP project (R7581) in Ghana, processing technologies were developed for the production of High Quality Bambara Flour (HQBF) by the Food Research Institute to alleviate the processing constraint that has been identified as a key factor limiting its utilization. The current project aims at dissemination of the HQBF technologies to promote bambara utilization which will be translated into expansion of production levels over time and thereby increasing income levels of both bambara processors and farmers as well as improving on the nutritional status of consumers. The project aims at establishment of a value added-chain through HQBF based recipe development, training of small-scale processors, and involvement of commercial processors as well as sale of well-packaged HQBF through identified market outlets.

As part of the activities under HQBF technology dissemination project, this socio-economic survey was conducted in the four selected project communities to investigate into the socioeconomic status of the bambara processors, assess the marketing potential of processed products and most importantly to establish the levels of all project performance indicators prior to the dissemination of HQBF technologies for impact tracking purposes. Findings from the survey would be critically examined and recommendations made to move the program forward. It is envisaged that once the applications of HQBF have been tested and proven, the replication and sustainability potential of the project would be great. This paper reports on both rapid appraisal and conventional survey of the bambara processing industry in the northern region using the selected project communities as case studies.

METHODOLOGY

Sampling Procedure and Survey Areas

To achieve the set objectives, both primary and secondary data were used. Informal survey, which preceded a formal survey, was conducted in February 2003 to generate qualitative information on the issues to be addressed in this study. Using rapid appraisal methodologies, a semi-structured interview was conducted with purposively sampled representatives of processors and key informants in the project communities. Five identified supermarkets were also visited to determine the possibilities of introducing HQBF onto the market and to check the market performance of similar products. A sample size of one hundred processors was chosen for the conventional survey in a stratified randomly selected fashion to ensure that a complete spectrum of data could be obtained. Twenty-five (25) processors were selected from each of the project areas, which include Tamale, Savelungu, Gushiegu Karaga and Tolon Kumbugu districts all in the northern region. The structured questionnaire modules consisted of coded questions covering basic information on seller socio-economic profile, processing methods, raw material sources, and variation in quantities and prices, labour, cost of processing, marketing, gross income and constraints. Impact tracking indicators were identified and their levels documented for performance tracking purposes.

Analysis of Data

Responses were coded and the Statistical Package for Social Science (SPSS) and Microsoft Excel used to process the data for descriptive analysis and cross tabulations. The analysis involved, frequency counts, graphs, and percentages that are used to present results and the relevant inferences made. Pearson correlation methodology was used to determine the level of relationship between some variables.

RESULTS AND DISCUSSION

Background of Processors

Bambara processing is exclusively a female activity as detailed in the composition of labour force analysis below. A processor may engage the services of hired female labour or assisted by female family members. Processing is done individually and on specialized lines. Thus, a woman processor either deals only in *tubani/gablee* or *koose* with very few exceptions. Respondents interviewed had ages ranging between 20 and 75 years with the majority (63%) within the active labour force group of 30 to 50 years of age. About seventy-nine percent (79%) of the processors interviewed were wives with only nine percent (9%) and twelve percent (12%) occupying head and relations to head positions in the household, respectively. Eighty-two percent (82%) of the women interviewed were Moslem while the rest were either Christians or traditionalists by religion. There was significantly (at 0.01 level using Pearson correlation method) high level of correlation between religion and marital status with more Moslems being married. As typical with traditional food processors, the level of education of the respondents was very low with less than 5% having attained middle school/JSS and the rest with no formal education. They were predominantly Dagombas (95%) and processing was the main income-generating activity for majority (90%) of the women. Again, processing seems to be one of the poverty-alleviating strategies adopted by most women in the communities visited since this requires less capital base. Some respondents also engaged in petty trading, other foods vending, as well as seasonal jobs like harvesting of farm produce, gleaning of rice fields and sheanut butter extraction. Less than fifteen percent of the respondents had affiliations with some other association. Unfortunately, no bambara processing group existed as at the time of the survey. Details on socioeconomic profile of respondents are presented in Table 1.

Table 1. Socioeconomic Profile of Respondents

Characteristics	Districts				
	Tamale	Karaga	Savelungu	Tolon	Overall
Position in household					
Head	8.3	12.0	81.0	14.8	9.3
Wife	91.7	60.0	19.0	81.5	78.4
Relation to head	-	28.0	-	3.7	12.3
Age					
<25	-	-	4.8	7.4	3.1
25-29	8.3	4.0	4.8	18.5	9.3
30-39	45.8	36.0	23.8	40.7	37.1
40-49	20.8	40.0	19.0	22.2	25.8
50-59	25.0	12.0	23.8	7.4	16.5
60-69	-	8.0	19.0	-	6.2
>70	-	-	4.8	3.7	2.1
Educational Level					
No formal Education	100.0	88.0	95.2	100.0	95.9
Primary/JSS/Middle	-	12.0	4.8	-	4.1
Secondary	-	-	-	-	-
Religion					
Christian	12.5	8.0	19.0	22.2	15.5
Moslem	87.5	88.0	81.0	74.1	82.5
Traditionalist	-	4.0	-	3.7	2.1
Marital Status					
Married	83.3	52.0	85.6	81.5	75.3
Single	8.3	32.0	4.8	3.7	12.4
Divorced	-	4.0	4.8	3.7	3.1
Separated	-	4.0	-	-	1.0
Widowed	8.3	8.0	4.8	11.1	8.2
Ethnic Group					
Dagomba	83.3	100.0	100.0	96.3	94.8
Bulsa	12.5	-	-	-	3.1
Kasem	4.2	-	-	-	1.0
Dagbani	-	-	-	3.7	1.0
Main Occupation					
Farming	-	24.0	4.8	3.7	8.2
Processing	100.0	72.0	95.2	92.6	89.7
Trading	-	-	-	3.7	1.0
Others	-	4.0	-	-	1.0
Secondary Occupation					
Farming	25.8	48.0	32.4	33.3	34.8
Processing	-	28.0	4.8	7.4	10.0

Fixed Salaryjob	4.2	-	-	-	3.1
Trading	33.3	24.0	4.8	20.4	20.0
Others	10.0	-	23.8	15.2	12.0
Not Applicable	26.7	-	34.2	23.7	21.0
Association					
Yes	-	8.0	23.8	18.5	12.4
No	100.0	92.0	76.2	81.5	87.6

Processing

Level of processing

Processing levels are currently low and range between 1-10 bowls (2.75 kg/bowl) of bambara per day, with an average of 4.2 bowls and 2.8 bowls processed per person in peak and lean seasons, respectively. Usually more is processed on market days, which occur every 6days (6-day cycle). For the purposes of this study, processing levels below 2 bowls of bambara per day is referred to as micro scale; 2-5bowls and 5-10 bowls per day are categorized as small and medium scale respectively. District specific distributions are presented in figures 1-4. As presented in Fig 5, eighty-eight percent (88%) of the sample interviewed are small scale operators and six percent (6%) each for micro and medium scale processing.

Table 2. Descriptive Statistics on Variations in Quantity of Bambara Processed and Prices

	Quantity of Bambara processed / person		Price per bowl of 2.75 kg (¢)	
	Peak Season	Lean Season	Peak Season	Lean Season
Minimum	1.0	0.5	4,000	6,000
Maximum	10.0	8.0	7,000	10,000
Mean	4.2	2.8	5,601	7,973
Std. Dev.	2.1	1.3	625	1166

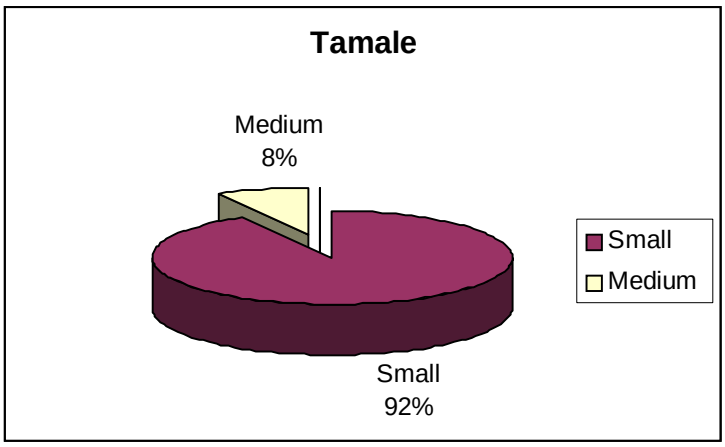

Fig 1. Percentage Distribution of Respondents in Tamale district by Processing Levels

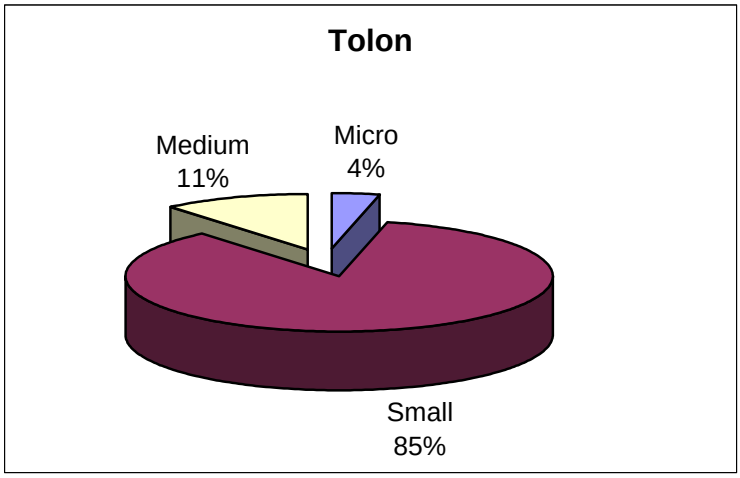

Fig 2. Percentage Distribution of Respondents in Tolon Kumbugu district by Processing Levels

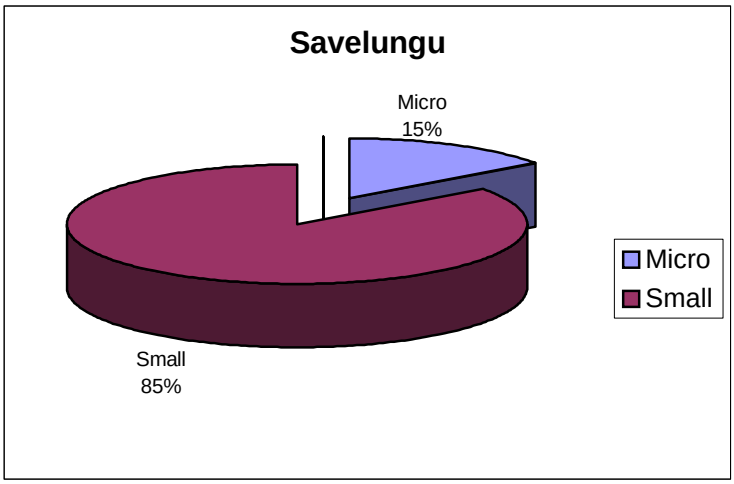

Fig. 3. Percentage Distribution of Respondents in Savelungu district by Processing Levels

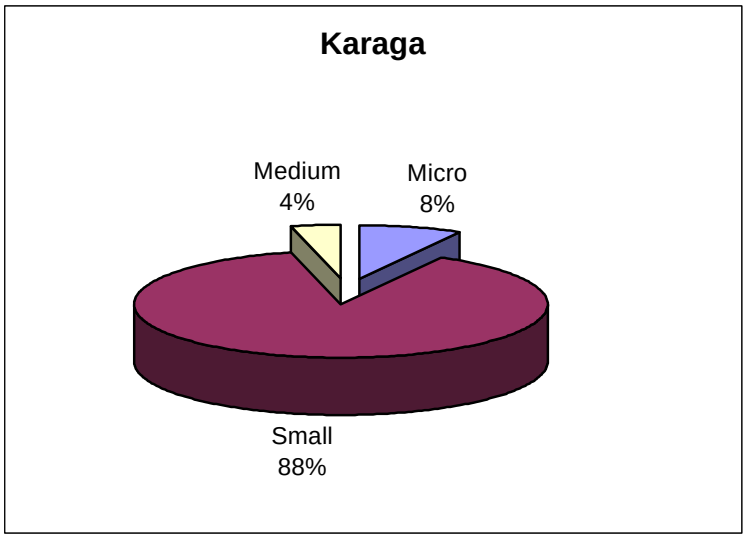

Fig 4. percentage distribution of respondents in Gushiegu Karaga district by processing levels

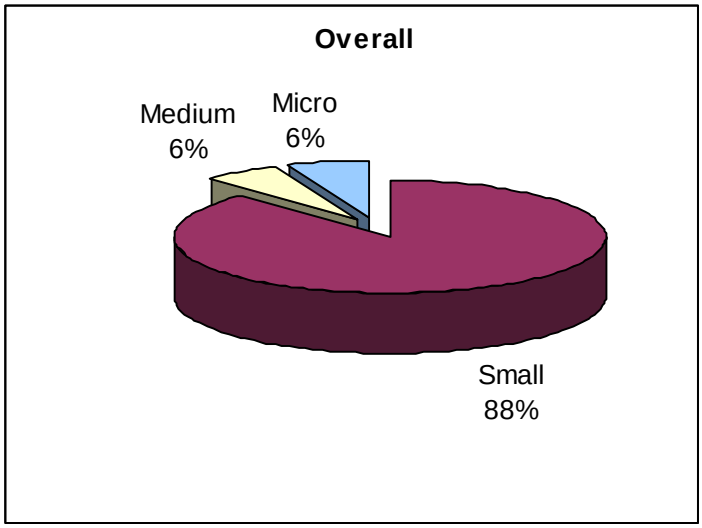

Fig 5. Percentage distribution of total respondents by processing levels

Some women also process only on market days especially in the semi urban and rural communities (this was typical in Savelugu and Tolon Kumbugu districts). Processing activities peak in the months of January- March when fruits are out of season and during the fasting periods when snacks are required to break fast (areas visited are predominantly Moslem communities), as well as peak-farming season when farmers need to take more filling foods. It is worth mentioning that bambara is very important to farmers as a food security crop which they fall on in times of food scarcity.

Source of raw material

As indicated in figure 6, about 73% of the total sample interviewed sourced bambara grains from the local market. Some also had to travel about 14 km in search of grain especially in the planting season when demand is high. Generally, bambara grain is obtained from the local market on market days due to proximity (21%), reliable supply (42%) and most importantly to ensure access to good quality grain (25%). Few (12%) of the respondents indicated good price, credit sales and reliable measurement as reasons for choice of source of bambara grains for processing (Fig 6).

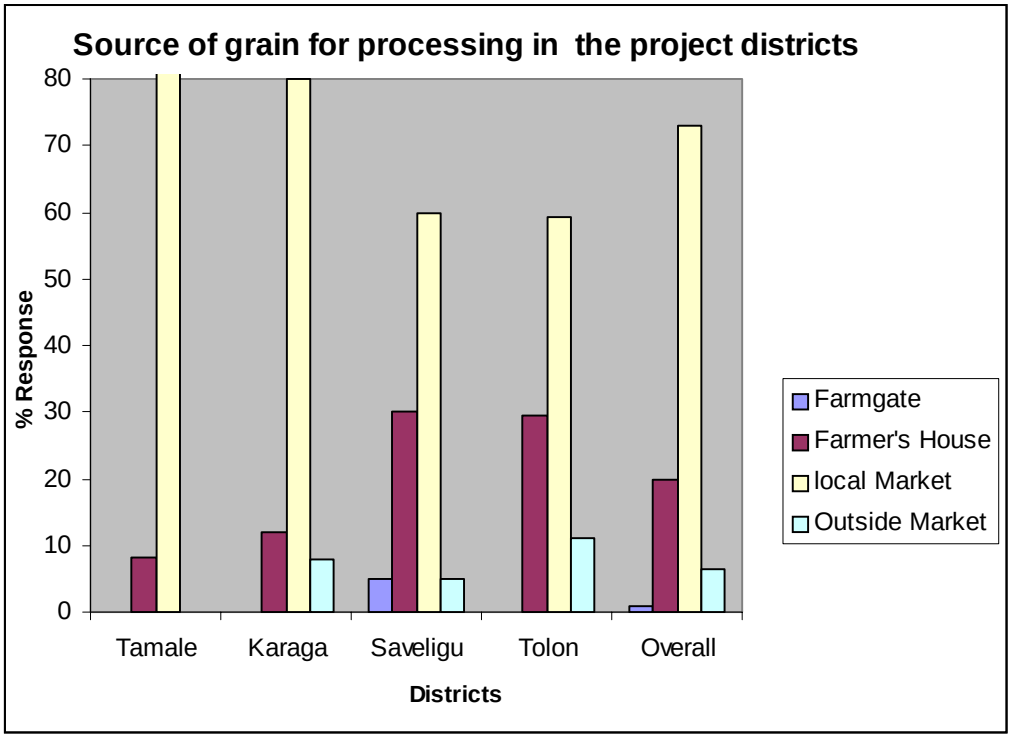

Fig 6. percentage distribution of total respondents by source of grain

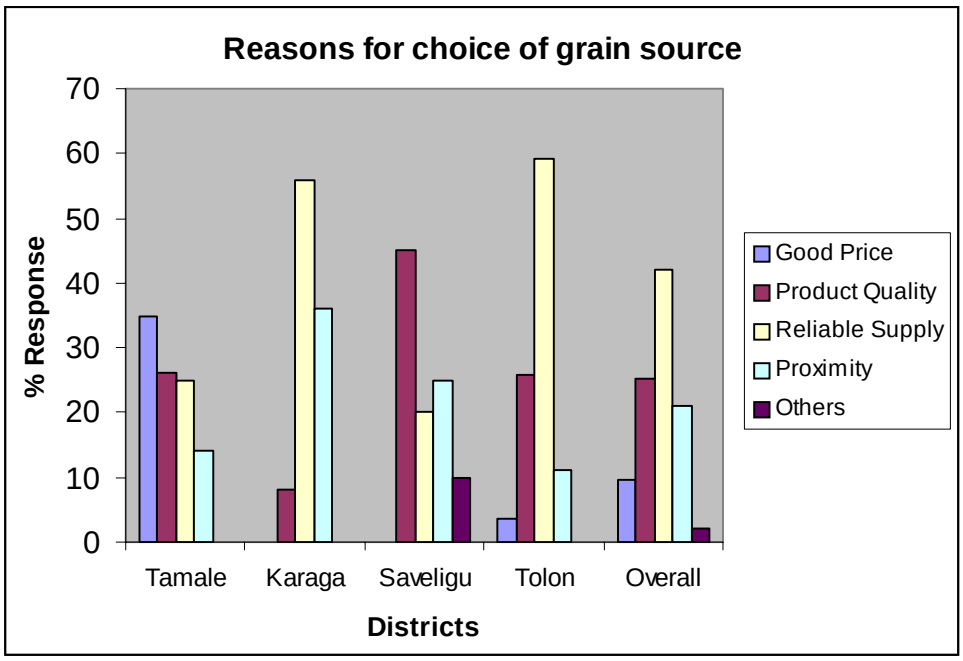

Fig 7. Percentage distribution of total respondents by reasons assigned for choice of source of grain

In recent times, quality has become a key-contributing factor in pricing of product. High quality products attract premium prices and even in situations where the pricing system does not reflect quality differences, high quality products are highly patronized. Invariably all processors prefer cream coloured grain which is well dried with minimal foreign materials so as to ensure maximum consumer satisfaction. Farmers in Zimbabwe as indicated by Hampson *et al.* (2000) also preferred white seed. This preference was attributed to its taste and popularity when selling for consumption. Inference from the present study established that high quality grains that produce good flour has the following characteristics:

- High flour turn-over (yield)
- Large size grains
- Cream coloured grains
- Well-dried
- Mould free
- Free from pest infestation.

However, processors' decisions to buy were based more on their perceptions of colour and size. There was about ¢1,000 price difference between high and poor quality bambara grain (high quality grain was sold at ¢6,000/bowl compared to ¢5,000/bowl for poor quality).

Availability of Bambara and Prices

Bambara grain is always available on the local markets in all the communities visited because stocks are held for stable supply throughout the year, especially at the market level. Sometimes grains are brought from Techiman, a major marketing center in the Brong Ahafo Region, to argument supply in the north when there is excess demand. There is variation in the quantities of supply over the year, which is reflected in pricing. As typical with most food crops, a declining price period, low price period, increasing price period and high price period could be distinguished from the bambara price cycles in Ghana (See also Nyanteng, 1998). Prices are very low in the harvesting season (September-October) for fresh grains but dried grains are usually costly at the beginning of harvest and during planting season. However, price of dried grain falls few months after harvesting when there is adequate supply on the market. Unfortunately, processors hardly practice bulk grain purchases for storage, which is rather common with wholesale traders, due to financial constraint. As indicated in the descriptive statistics on variations in bambara prices, the minimum and maximum prices reported by the sample interviewed for the peak season are ¢4,000/bowl and ¢7,000/bowl respectively while a minimum of ¢6,000/bowl and a maximum of ¢10,000/bowl was recorded for the lean season representing a variation of about 50% over the year period.

Labour use

The study observed that bambara processing is highly gender sensitive with only females being involved in the processing activities. This phenomenon could be explained culturally; processing is labeled as a feminine job and not for men in the communities visited. As shown in Table 3, unpaid family labour is commonly used. All the respondents interviewed in Savelugu district used solely family labour for all the activities involved in processing. About eighty-three percent (83%), seventy percent

(70%) and forty percent (40%) of the respondents in Tamale, Tolon Kumbugu and Gushiegu Karaga districts respectively used family labour only. It was also realized that home-based processors invariably use unpaid family labour while market based processors either have family labour assisting or use hired labour. As explained by some respondents, using family labour gives them the opportunity to impact processing skills to their daughters and thereby ensuring the sustainability of the industry. There is however some degree of specialization in labour use. Female children are usually engaged in selling *koose* (hawkers who go round the market selling *koose* in open trays) though this is not common among *Tubani* and *Gablee* sellers who tend to be more stationary and therefore use less number of children. Children may also be engaged in sorting and cleaning while adult females do sourcing of grains and the actual processing work. Total average daily composition of labour force per processor for various activities ranges between 1 and 3 adult equivalents depending on quantity processed and may or may not be adjusted according to variations in processing.

Table 3. Number of Labour Used by Processors

Number of family labour/processor	**Percentage Distribution of Type of labour used by Respondents**			
	Tamale	***Karaga***	***Saveligu***	***Tolon***
Children				
NA	58.3	36.0	23.8	74.1
1	29.2	44.0	33.3	18.5
2	12.5	20.0	33.3	7.4
3	-	-	9.5	-
Adult Females				
NA	4.2	54.0	9.5	44.4
1	54.2	16.0	85.7	48.2
2	41.7	20.0	-	7.4
3	-	-	4.8	-
Number of hired labour/ Processor				
NA	83.3	40.0	100	70.4
1	-	16.0	-	14.8
2	12.5	44.0	-	11.1
3	4.2	-	-	3.7

Quantitative analysis showed that a significant proportion (60%) of the processors interviewed do not adjust the number of labour used in processing and there was a significant (at 10% significant level) and positive correlation between hired labour used vis-à-vis labour force adjustment using the Pearson correlation method. This implies that those who use hired labour tend to adjust their labour upward when processing more and vice versa. Children are given ¢2,000 as daily wage plus feeding while adults are given up to ¢5,000 per day depending on the amount of work done.

Equipment / Input Requirement

Simple equipment are used and are easily available on all the local market days or always available on Tamale market. These include frying pan, sieve, calabash, aluminum pans, clay pot, plastic plates, basin, perforated ladles, open tray and strainer. As indicated in Tables 4 and 5, minimum Investment requirement for processing *tubani* and *koose* is approximately ¢330,000 and ¢400,000 respectively (this excludes working capital for variable inputs). Milling facilities are available as service in all the communities.

Table 4. Equipment/Input Requirements for Processing Koose

Equipment	Quantity	Unit Cost (¢'000)	Total Cost (¢'000)	Useful life (years)	Annual Depreciation
Aluminum Pot (Big Size)	1	80	80	10	8000
Aluminum Basin	1	60	60	6	10000
Bucket/water holding container	2	40	80	10	8000
Rim Stove	1	50	50	8	6250
Frying Pan	1	60	60	10	6000
Perforated Ladles	1	3	3	3	1000
Open Tray (Big)	1	30	30	5	6000
Open Tray (small)	1	20	20	5	4000
Calabash	1	3	3	0.5	6000
Sieve	1	3	3	0.5	6000
Basket/Colander	1	3	3	1	3000
Total	-	-	392	-	64250

Table 5. Equipment/Input Requirements for Processing Tubani

Equipment	Quantity	Unit Cost (¢'000)	Total Cost (¢'000)	Useful life (years)	Annual Depreciation
Aluminum Pot	1	80	80	10	8000
Aluminum Basin	1	60	60	6	6000
Bucket/water holding container	2	40	80	10	8000
Rim Stove	1	50	50	8	6250
Calabash	1	3	3	0.5	6000
Knife	1	3	3	2	1500
Sieve	1	3	3	0.5	6000
Stool	1	5	5	2	2500
Wooden Bench	1	30	30	3	10000
Serving Plate	10	1	10	1	10000
Spoon	10	0.5	5	1	5000
Total	-	-	329	-	69250

Marketing

To embark on any effective expansionary measures in the bambara industry with respect to processing and utilization, it is very important to understand the organization and structure of the value-added supply and demand chains; identification of available market outlets to processors, accessibility to such markets, demand side issues like consumer taste and preferences, as well as constraints that could hinder progress. This part of the report therefore addresses some of the above-mentioned issues.

Bambara Products Inventory

As indicated in the marketing constraints enumerated by respondents, bambara products have very limited market, partly due to the low level of appreciation of its nutritive value among the new generation coupled with its long cooking and stomach-bloating problems mentioned earlier. The marketable bambara based products available in the communities visited include *koose, tubani, gablee,* roasted, dried and freshly boiled bambara. There is however, a high cultural diversity in the preparation methods and the name of a particular bambara product may vary from one tribe to another. The most common preparation methods of the marketable products are briefly described below:

- ***Koose*** – Add 1 portion of water into 1.5 portions of sieved bambara flour and beat into smooth and light paste. Salt, ground onion and pepper are added to taste and sometimes saltpeter is added. The mixture is scooped into balls and fried in oil.

- ***Tubani*** - Add 1 portion of water into 1.5 portions of sieved flour (some processors used equal portion of cassava or yam flour to bambara flour) and beat into smooth and light paste. Scooped into wrappers (polythene/leaves) and steamed in hot water.

- ***Gablee*** - preparation method similar to tubani but are not wrapped in leaves or polythene before boiling.

- ***Roasted bambara –*** Dried bambara may be roasted with groundnut for sale. This is usually available all year round.

- ***Freshly boiled bambara –*** Add water and salt to bambara and boil. The market for freshly boiled bambara is highly seasonal and is only available during the harvest season.

- ***Dried boiled bambara –*** Dried grain is soaked, boiled with salt to taste. This is either eaten raw or other ingredients are added and used as sauce

Apart from the above-mentioned marketable bambara products, there are a lot more bambara-based traditional dishes that are prepared at the household levels for home consumption only. Currently, more than ten (10) existing bambara products have been identified and their nutritional information documented in the (Nti, 2003). It should be noted that the present study is focused on bambara flour-based products. As depicted in figure 8, processing is done on more specialized lines with majority (98%) of the respondents interviewed either into *tubani*, *gablee* or *koose*. In terms of marketability of products, *koose* is ranked first followed by *tubani* and then *gablee*. The former is difficult to prepare at the household level. Few of the respondents processed combination of products at a time.

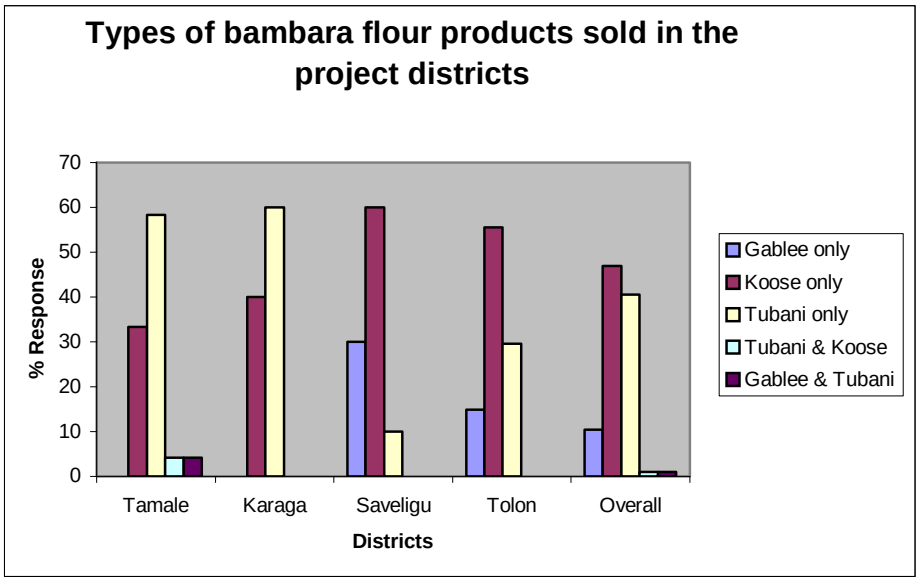

Fig 8. Distribution of respondents according to type of bambara product sold

Market Outlets for processed products

Bambara flour-based products are retailed directly to consumers. The whole marketing system is informally managed without any external control except for those who operate inside the general markets who may have to go by the market regulations. The survey identified home-based, daily markets, cyclical markets/market days, roadside and institutional (schools/workers premises) as the main retail outlets for bambara products. Home-based, daily markets and market days are important retail outlets to respondents. Buyers of bambara flour-based products include workers, school children, farmers, traders and the general public. Fifty-five percent (55%) of the total sample interviewed indicated reliability of buyers as the main reason for choice of customers while thirty-three percent (33%) and twelve (12%) assigned accessibility & availability, and good price as reasons for choice of customers respectively.

- ***Home-based sellers***: These sellers normally focus on consumers in and around their neighborhoods who are more comfortable with reliability and accessibility to food outlets, with less consideration for quality issues. Levels of processing of these types of sellers are relatively small and sometimes have specific times of selling. Home-based sellers are very common in almost all the communities visited especially the rural ones; approximately, 46%, 52%, 62% and 60% of

respondents in Tamale, Tolon Kumbugu, Gushiegu Karaga and Savelugu districts used this retail outlet.

- ***Market place sellers***: These sellers focus on widening their customer base and are more concerned about quality issues. They usually process more than the home-based sellers and may serve variety of dishes in addition to *tubani* or *gablee*. *Koose* sellers may also sell porridge or sell beside porridge sellers. Some women processors operate only on market days to ensure adequate numbers of customers for more profit. Retailing at the market place is highly competitive and processors put in more effort to respond to consumer preferences. It was also realized that at the rural markets, processors take into consideration ability of the consumer to pay. For example, *koose* was retailed at ¢50.00 selling units in Tali market as compared to ¢100.00 selling units in Tamale market.

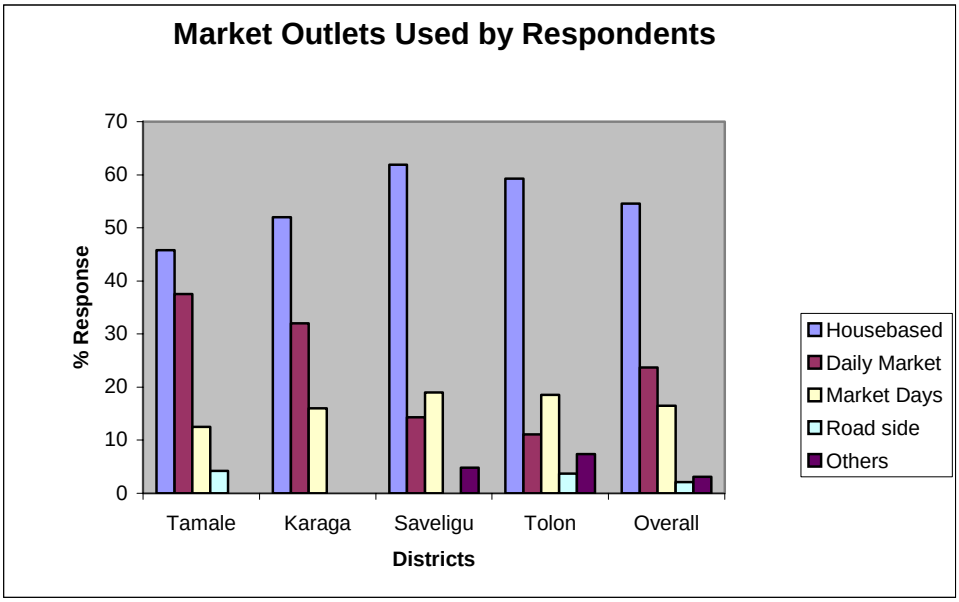

Fig 9. distribution of respondents according to market outlet used

- ***Roadside sellers and vantage points sellers***: These sellers are located at permanent places along the roadside and aim at attracting more commuters. They are also concerned about quality issues and eye appeal to customers. Processing levels of roadside sellers in the urban centers are relatively high and may operate throughout the day.

- ***Schools /work premise sellers***: These processors target only school children or workers and are located permanently at such compounds. Processing levels are usually low.

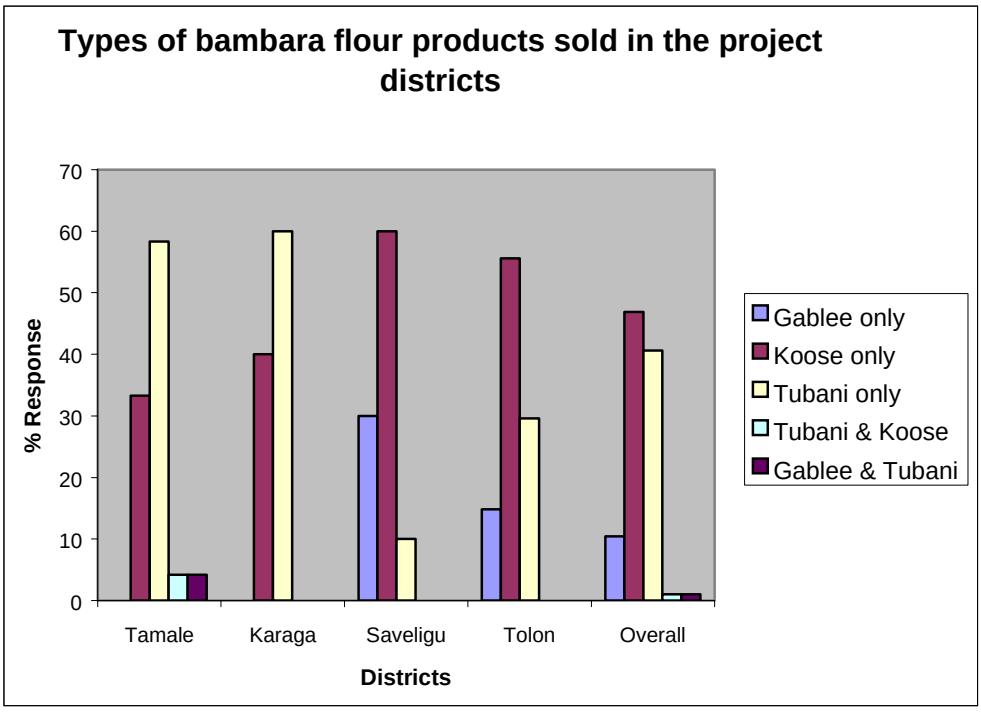

Fig 10. Distribution of Respondents according to Product Sold

Preparation of flour / Processing methods

Bambara flour processing techniques are variable among communities visited and in some cases differences exist among processors. Generally, the level of technology used is low and basically involves sorting/cleaning of grains, de-hulling (may or may not dehull), winnowing, milling and sieving. Three main processing methods were identified and shown diagrammatically below. Conversion rates and qualities of bambara flour produced by the different methods were not investigated.

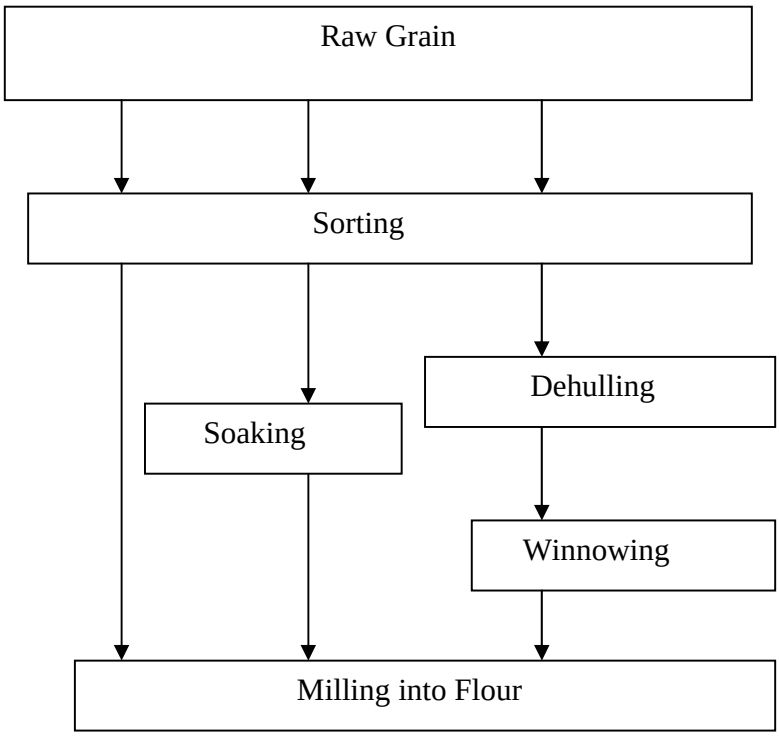

Fig 11. A simplified flow chart depicting bambara flour preparation methods

Margins

Estimates of gross incomes on the processing activities were calculated by taking into consideration all the variable costs involved in processing and the revenue accruing from sale of products. Variable costs involved in processing include cost of bambara grains, labour, water, milling, fuel, oil/shea butter, spices and packaging for *koose* plus cassava/yam flour and *bungu* for *tubani*. Labour cost estimates were concentrated on extra hands used; efforts by processors themselves were not captured. Thus, margins computed also represent the reward on processors' efforts as well as their investment. Gross margins were computed for individual tubani and koose processors, averages per district estimated and the results presented in Tables 3 and 4. To obtain accurate figures on revenues from sale of products, a sample of *koose* and *tubani* processors were given 2 bowls of grains each to process and the sales figures used as a control or a check against data provided by processors in general. It was realized that most processors could not give accurate sales figures since no records were taken on quantities consumed and/or given out as gifts to friends and relatives. Considering the fact that margins on processing

were generally low, sometimes processors may run into losses if substantial amounts are given out as souvenirs or consumed by household members, and when there are a lot of unsold products.

Table 6. Gross Income Analysis for Koose preparation

Item	Processing Costs, Revenue & Gross Income (cedis)			
	Tamale	**Gushiegu Karaga**	**Savelungu**	**Tolon Kumbugu**
Grain (Qty)	13800(2.6)	18857(3.2)	16250(2.4)	10400(2)
Water	1000	1557	1187	1000
Milling	2600	1571	1312	1200
Fuel	3800	4714	2500	2000
Oil/Shea butter	17400	22571	18000	15000
Spices	5000	5285	2937	3000
Packaging	2333	2000	1187	1000
Labour	3666	3714	6000	3000
Av. Variable Cost	47200	59129	44125	36600
Revenue	53300	64428	48687	41000
Gross Income	**6100**	**5299**	**4562**	**4400**

Table 7. Gross Income Analysis for Tubani preparation

Item	Processing Costs, Revenue & Gross Income (cedis)			
	Tamale	**Gushiegu Karaga**	**Savelungu**	**Tolon Kumbugu**
Grain (Qty)	17214(3)	21333(3.5)	12000(2)	16500(2.75)
Cassava/Yam Flour	6428	12000	8000	8750
Water	3285	2333	1000	1250
Milling	2928	1750	1000	2000
Fuel	4428	3500	2000	4500
Oil / Shea butter	17142	17333	10000	17500
Bungu	8000	16333	8000	8750
Other spices	3500	5250	2000	2000
Packaging	2857	4000	2000	1750
Labour	3166	4000	2000	3750
Av. Variable Cost	68000	83583	47000	66750
Revenue	76500	89250	51000	70125
Gross Income	**8500**	**5666**	**4000**	**3375**

Gross margins are highly variable. Factors affecting gross margin on the bambara processing activity include, geographical location, cost of grain and other materials, quality of grain, level of patronage, scale of processing, and management practices adopted by the processor in terms of labour used and wastage (unsold products, give aways, etc, etc). On the average, gross margins on both *koose* and *tubani/gablee* range between ¢8,500 and ¢3,375 per processor per day. This translates into monthly income of ¢9,500 to ¢240,000 per processor. The study also found out that there is slightly more profit on *tubani* than *koose* but the latter is more marketable. Maximum daily gross margin per *tubani* processor of was estimated at ¢10,000, ¢9,000, ¢9,000 and ¢6,000 in Tamale, Gushiegu Karaga, Tolon Kumbugu and Savelungu districts respectively while minimum figures stood at ¢6000, ¢4000, ¢4000 and ¢4500 respectively. For *koose*, maximum daily gross margin per processor was estimated at ¢9,500, ¢7,000, ¢9,000 and ¢6,000 in Tamale, Gushiegu Karaga, Tolon Kumbugu and Savelungu districts respectively while minimum figures stood at ¢6,000, ¢2,600, ¢3,000 and ¢2,000 in the same order. These figures compares favorably with the margins quoted by the respondents in the rapid appraisal studies, which were ranged between ¢3,000 and ¢10,000 per processor per day.

Constraints

This study disaggregates factors that negatively affect the bambara processing industry into raw material & equipment, processing, marketing and storage constraints.

Processing

Processing constraints faced by respondents (Fig 12) are outlined below in decreasing order of importance:

- Drudgery involved in winnowing and beating of flour mixture
- Inadequate water for processing, especially during the dry season. This was found to be a problem in Gushiegu Karaga and Tolon Kumbugu
- Long cooking periods
- Other issues are inefficient grinding mills, heat effect on eyes, poor grain quality and lack of shelter

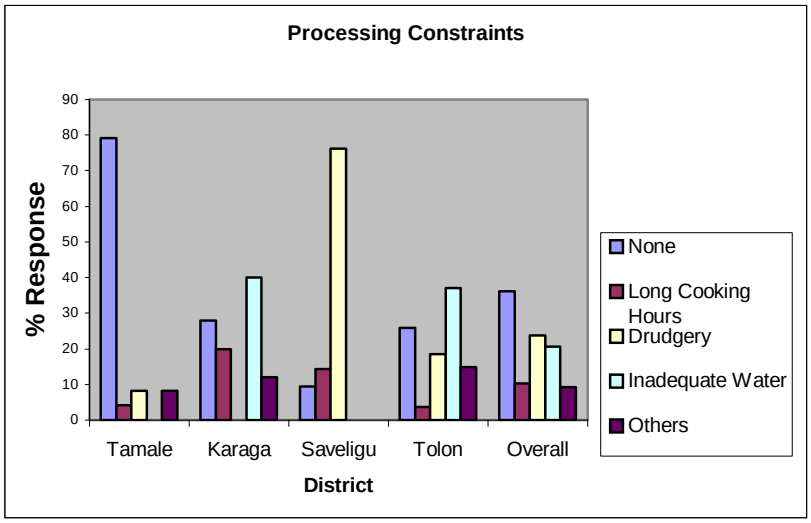

Fig 12. Percentage distribution of respondents by processing constraints

Marketing

Surprisingly, a significant (47.4%) proportion of the sample interviewed had no complains with respect to marketing of their bambara-based products. This group of processors either did not see possibilities of changing the market situation or just did not want to share their worries. The major factors limiting marketing of bambara-based products include low patronage/limited market, and credit sales. Others are unattractive selling price (especially in the rural market to meet the pocket of customers), wastage from unsold products and theft at the selling points, lack of shelter (Fig 13).

Raw Material & Equipment

High cost of equipment, lack of money for bulk purchases of grain, irregular supply of grain and sometimes traveling long distances in search of grain are the constraints faced by the respondents ranked in decreasing order of importance (Fig 14).

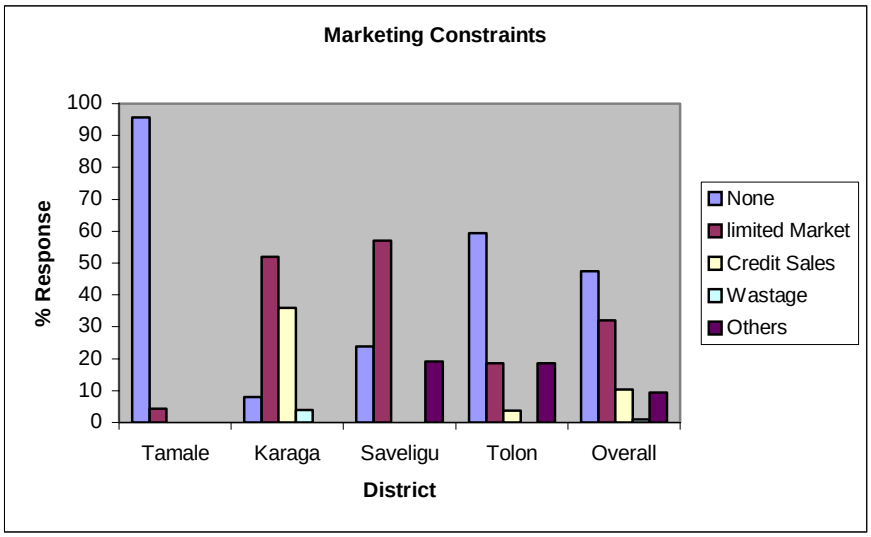

Fig 13. Percentage distribution of respondents by marketing constraints

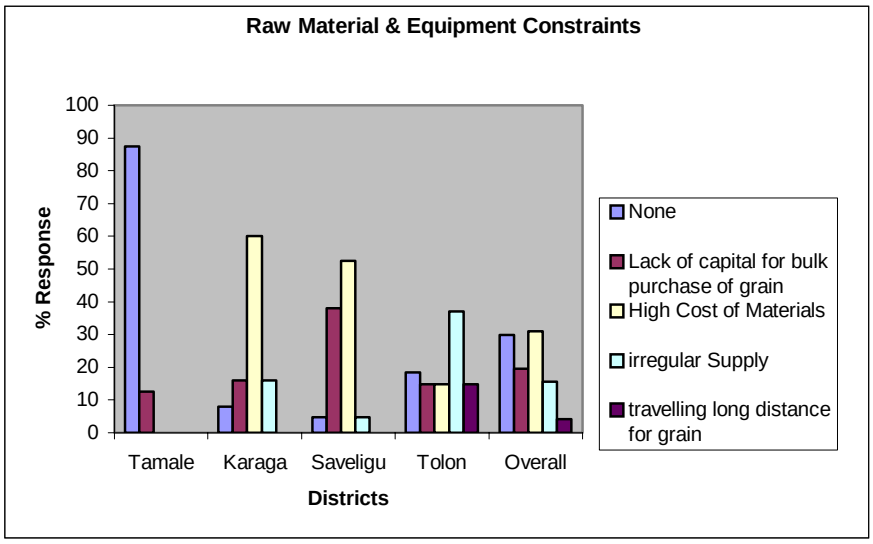

Fig 14. Percentage distribution of respondents by constraints with raw materials & equipment

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Storage

Apparently, unsold products had to go waste due to unavailability of storage technology. Respondents therefore reported short shelf life of processed products as a major storage related constraint. Hardening of products when cold was also a problem since it becomes difficult to sell.

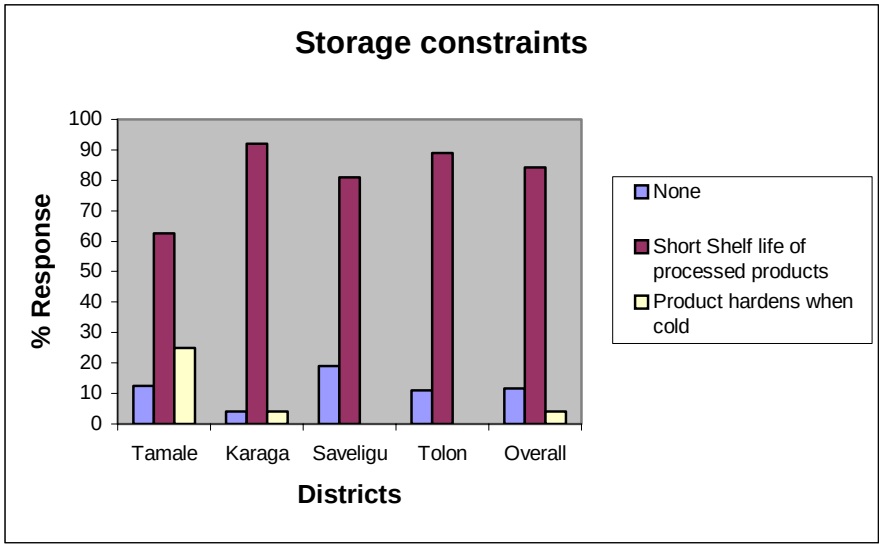

Fig 15. Percentage distribution of respondents by storage constraints

Performance Indicators

Outreach /Clients & Stakeholders

The HQBF technology dissemination process will consist of training workshops and demonstrations, distribution of fact sheets, community radio adverts and other promotional activities. Apart from processors other stakeholders like NGOs, MoFA staff, cateress, and commercial operators will be trained as well as promoting sale of products through identified market outlet or supermarkets. In the performance tracking system the number of enterprises that will receive technical training on HQBF will be captured. These will include those who will be assisted to establish new businesses as well as enterprises that will be assisted to increase efficiency through adoption of HQBF

technologies. Thus, background information relevant for adoption studies will be generated.

Economic Impact

Economic impact will be measured from increased income associated with producer cost savings, sale of final goods and consumer benefits as a result of the project. Producer Cost savings could be obtained either through reduction in input requirement or increase in conversion rates. With respect to sale of final goods, it is expected that processors will earn more income by selling more products through market expansion as a result of the project i.e. increase in processing levels and/or increase in unit price of the products Consumers will benefit from product quality efficiency as a result of the project (a proxy would be used to capture this). The base levels of all project performance indicators are summarized in Table 8.

Table 8 Base levels of performance Indicators

Indicator	Current level	Expected level
Processing technology	Traditional	HQBF
Socio-economic		
• Processing levels	1-10bowls/processor/day	Increase in processing level
• Monthly Income levels	¢84- 280,000/processor	Earn additional income
• Number of people earning extra income (use of HQBF)	0	-
• Private sector involvement	-	Involvement of 2 commercial operators
• Market outlets for HQBF	0	25 market outlets
Number of Recipes	11	30
Training		
• Number of Demos/workshops	0	-
• Number of people trained	0	200 processors,10 NGOs & cateress
Promotional Activities		
• Radio Adverts	0	-
• Fact sheet/brochures distributed	0	-

General Findings and recommendations

Findings

- Bambara processing is exclusively a female activity and is full-time job for most of the women interviewed. It is a trade which is passed on from generation to generation, most daughters taking over from the mothers

- Processing is on a limited scale, ranging between 1 -10 bowls of bambara/day and processing is done throughout the week (5-8 h a day).

- Koose, Tubani and Gablee are the popular foods prepared from bambara for sale. However, there is high degree of tribal diversity and variability in the preparation methods. These products are retailed directly to consumers.

- All food vendors process their own bambara flour to ensure good quality flour. As one processor puts it '*flour has to be fresh*'. Bambara flour is not available on the market.

- Processors prefer the cream coloured , big size and well dried bambara grains due to its taste, flour yield and end-product quality

- A quick assessment of the processing/food preparation activities of the women revealed daily gross margins of ¢3,000 to ¢100000. This translates into monthly income of ¢84,000 to ¢280,000

- Gross margins are highly variable. Factors affecting gross margin on the bambara processing activity include, geographical location, cost of grain and other materials, quality of grain, level of patronage, scale of processing, and management practices adopted by the processors.

- With the exception of processing levels, incomes and bambara recipes, all other performance indicators are starting from the zero-base.

Recommendations

- There is the need to consider all the different methods of food preparation and come up with more standardized and widely accepted recipes.

- The project should focus more on processors with enterpreneurial capacities, especially those who process more than 5 bowls / day and are more interested in adding profitable product lines to existing businesses or introducing variety of dishes to their main lines of operations.

- Cream colored and big size grains should be hsedbfor HQBF production.

- HQBF for the supermarket should be package in a well labeled and attractive packaging material with adequate nutritional and utilization information.

- Work on shelf life studies of bambara based products should be encouraged.

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